ILLEGIB

Next 1 Page(s) In Document Exempt

13657

SECRET

№ 103

25X1

Economic Intelligence Memorandum

LEVEL OF OPERATION OF THE CEMENT INDUSTRY IN COMMUNIST CHINA IN 1963

CIA/RR EM 64-6
March 1964

CENTRAL INTELLIGENCE AGENCY
Office of Research and Reports

25X1

SECRET

SECRET

25X1

Economic Intelligence Memorandum

LEVEL OF OPERATION OF THE CEMENT INDUSTRY IN COMMUNIST CHINA IN 1963

CIA/RR EM 64-6

WARNING

This material contains information affecting the National Defense of the United States within the meaning of the espionage laws, Title 18, USC, Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

SECRET

25X1

FOREWORD

In the absence of data from official sources, aerial photography during the past few years has provided a means for roughly estimating the level of operation in a number of important industries in Communist China.* One such industry, which is particularly important because it provides an indicator of increases or decreases in the level of construction activity, is the cement industry. This memorandum, therefore, presents the findings from analysis of photography of the Chinese Communist cement industry in 1963 and updates some of the conclusions reached in a memorandum in 1962 on the same subject: CIA/RR EM 62-20, Level of Operation of the Cement Industry in Communist China in 1962: A Study Based on Aerial Photography, [redacted] SECRET/NO FOREIGN DISSEM.

25X1

25X1 [redacted]

CONTENTS

Appendixes

Table

Illustrations

LEVEL OF OPERATION OF THE CEMENT INDUSTRY IN COMMUNIST CHINA IN 1963*

Summary and Conclusions

In 1963, production of cement from major plants in Communist China probably totaled between 6 million and 8 million metric tons,** an increase of roughly 20 percent above the estimated 5 million to 7 million tons in 1962.*** The operating level of the industry in 1963 is believed to have increased to between 55 and 60 percent of rated capacity compared with a level of 45 to 50 percent during the previous year. The increase in production of cement in 1963 suggests that the total volume of construction throughout the country also increased from its low level of 1961-62.

A comparison of 18 plants photographed in both 1962 and 1963 revealed no great change in the level of operation at 15 plants, but 3 important plants -- at Shanghai, at Liu-li-ho near Peiping, and at Yung-teng above Lan-chou† -- were clearly operating at a higher level in 1963. However, photography of a number of other cement plants -- construction of which started during the "leap forward" movement when cement was in critically short supply -- revealed that construction either has stopped or is progressing at a very slow pace. The decision to slow or halt construction at these plants reflects the drop in demand following the collapse of the "leap forward" and strongly implies that present installed capacity is adequate for some time to come.

---

* The estimates and conclusions in this memorandum represent the best judgment of this Office as of 15 February 1964.

** Tonnages are given in metric tons throughout this memorandum.

*** This is a revised estimate for production in 1962; the reasons for the revision are discussed in II, p. 4, below.

† See the map, Figure 1, following p. 4.

I. Background

1. Major Plants

The core of the cement industry in Communist China consists of medium and large rotary-kiln cement plants capable of producing from 100,000 to about 700,000 tons of cement per year.* Many of these plants were established originally by the Japanese in Manchuria and in the maritime provinces during their occupation of the mainland. During the First Five Year Plan (1953-57) the Chinese Communists reconstructed and modernized these old plants with aid from the Soviet Bloc and increased the capacity of the cement industry to a level much higher than the pre-1949 peak.

While existing cement-making facilities were being rehabilitated, the Chinese Communists realized that additional plants were needed to maintain their expanding construction program. During the early and middle 1950's, therefore, the regime negotiated with the European Satellites for the importation of complete sets of equipment for new cement plants. The main supplier of this machinery was East Germany, although Czechoslovakia, Rumania, Poland, and one non-Bloc country -- Denmark -- also supplied equipment. By building new cement plants the regime not only was able to expand capacity but also to locate the industry closer to inland centers of construction. The latter consideration was especially important because inland construction projects had been dependent historically on maritime sources of supply, necessitating long and expensive transportation hauls that materially increased the cost of construction and increased the burden on an already overtaxed transportation system. A number of these Communist-built plants have been completed, and a number are still under construction.

2. Small Plants

In addition to constructing plants with rotary kilns, the Chinese Communists have constructed a large number of small cement plants with shaft kilns. These plants have a designed capacity of about 30,000 tons or less and produce a low-quality product that is consumed in the construction of local projects. In 1959 the regime claimed that 1.72 million tons of cement out of a total national production of 12.27 million tons was produced by these small plants (about 14 percent of total production). Evidence indicates that some small plants in China produced cement in 1963, although presumably at a much lower level than during the "leap forward" years of 1958-60.

---

* The majority of the rotary-kiln cement plants in China produce from 200,000 to 400,000 tons per year. For examples of rotary-kiln cement plants, see the photographs, Figures 2 and 3, following p. 4.

II. Revision of the Estimate of Performance in 1962

In the memorandum on aerial photography of the cement industry in Communist China in 1962, 1/* it was estimated that production was between 6 million and 8 million tons and that rated capacity** of the industry was between 12 million and 16 million tons. Aerial photography that became available after the memorandum was published in 1962, however, indicates that the estimates for production and rated capacity in 1962 were too high and should be lowered to a range between 5 million and 7 million tons and 11 million and 14 million tons, respectively.*** This downward adjustment is necessary because photography in 1963 revealed (1) that some plants that were believed to be completed and in operation had not been completed and (2) that two plants previously believed to exist are nonexistent: the Sian plant is actually the Yao-hsien plant, and the Liao-yang plant is actually the Hsiao-t'un plant. In 1962 these plants were mistakenly counted as four instead of two separate facilities.

III. Level of Performance in 1963

1. Coverage

In 1963, 24 medium-size and large cement plants were photographed,† representing approximately 65 percent of the total rated capacity of the cement industry in Communist China. By October 1962, when the memorandum for that year was written, 21 plants representing about 60 percent of rated capacity had been photographed. In both 1962 and 1963 the geographical pattern of coverage ranged from the old industrial areas in Manchuria to as far west as K'un-ming and Lan-chou in the provinces of Yunnan and Kansu. Many pre-Communist and 12 important Communist-built plants were photographed at least once and in some cases as many as three times.†† Of the 24 plants photographed in 1963, 10 were operating at a high level, 6 were in partial operation, 4 were not in operation, and 4 were in various stages of construction. More

---

* For serially numbered source references, see Appendix D. For a discussion of aerial photography as a source of information on the cement industry, see Appendix A.

** The term rated capacity in this memorandum refers to the theoretical maximum output that a plant is designed to produce if operated for 24 hours per day, 365 days per year. Allowing for downtime for repairs and maintenance, an operating level of from 80 to 90 percent of rated capacity is considered to be very good.

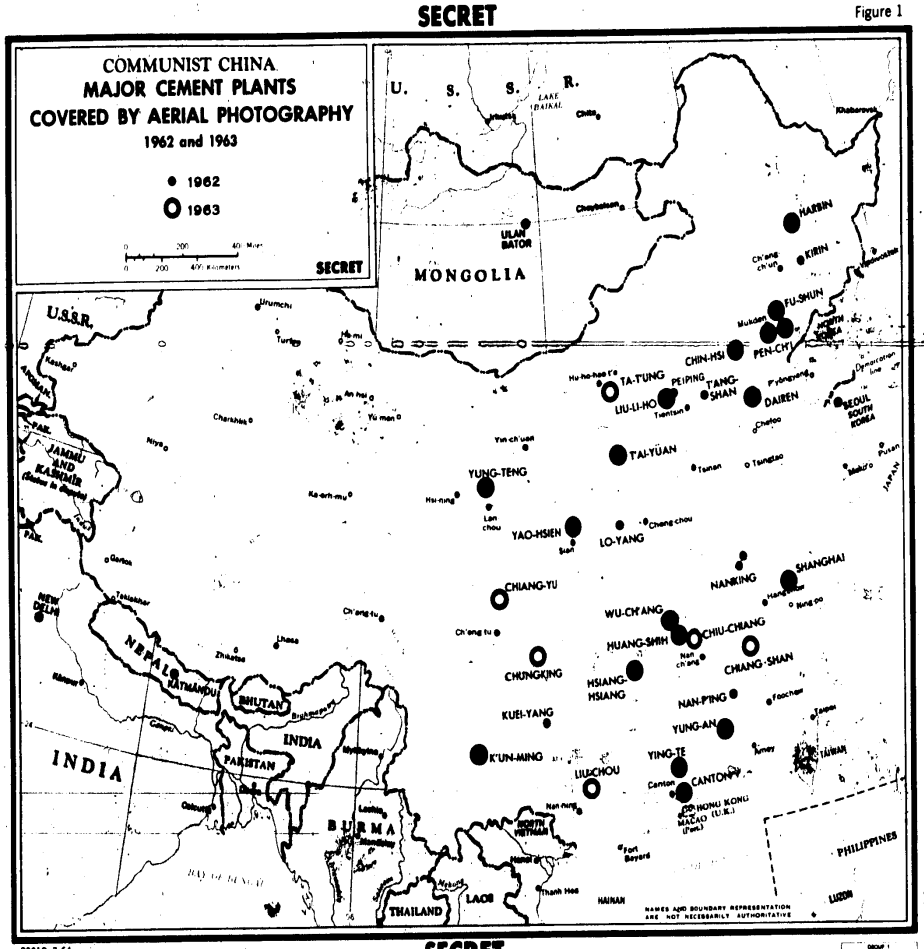
*** In 1963 the Chinese claimed that "present capacity in the cement industry is over 20 times that of 1949." Although the precise meaning of the term capacity is not clear, 20 times 1949 production would be approximately 13 million tons.

† There are approximately 30 medium-size and large cement plants in Communist China.

†† For a list and a map of the plants photographed, see Appendix C and Figure 1.

SECRET

Figure 1

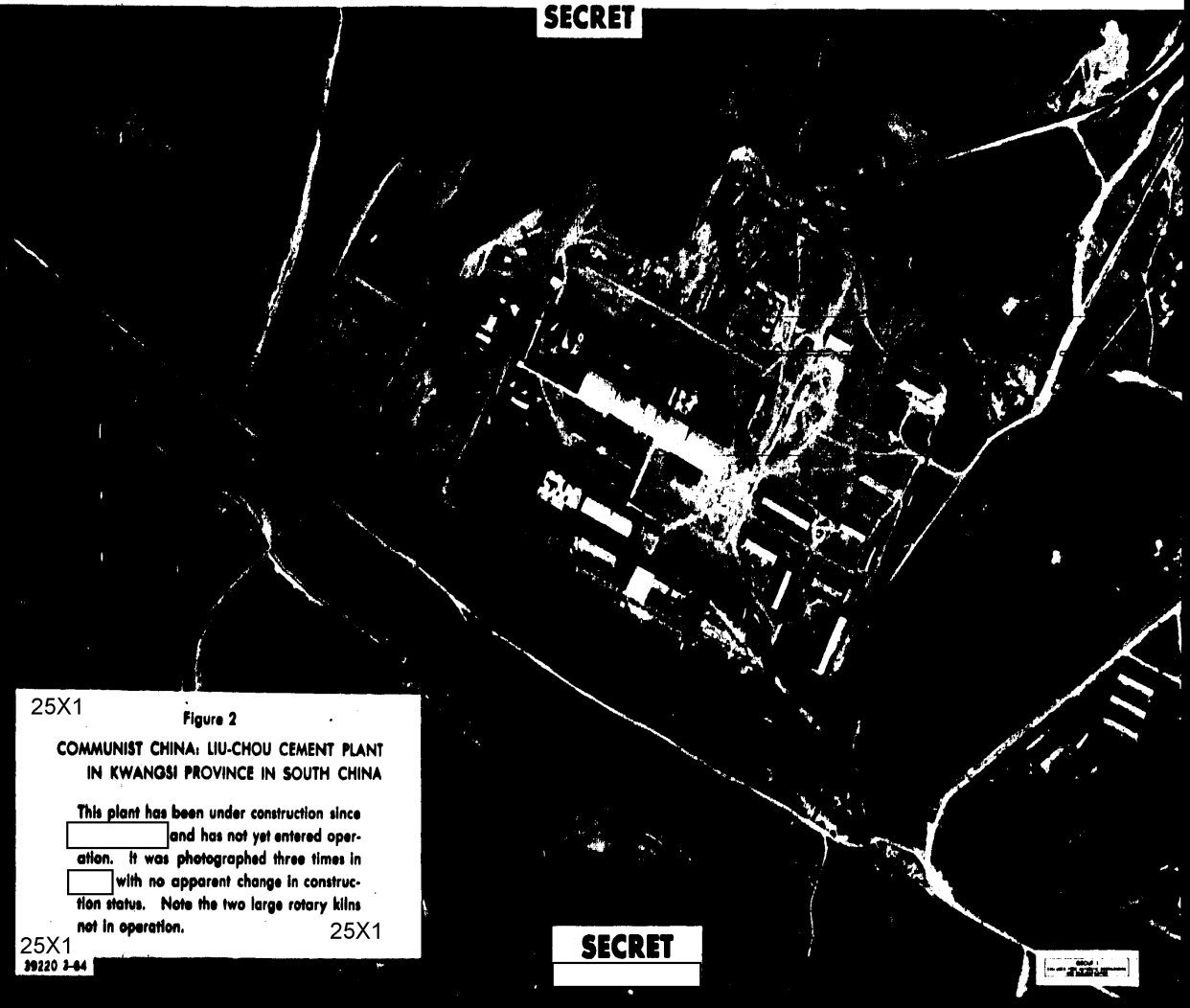


39219 3-64

SECRET

25X1

SECRET



25X1

Figure 2

COMMUNIST CHINA: LIU-CHOU CEMENT PLANT IN KWANGSI PROVINCE IN SOUTH CHINA

This plant has been under construction since [redacted] and has not yet entered operation. It was photographed three times in [redacted] with no apparent change in construction status. Note the two large rotary kilns not in operation.

25X1

25X1

39220 3-64

SECRET

25X1 25X

Figure 3

COMMUNIST CHINA: CHIN-HSI CEMENT PLANT IN LIAONING PROVINCE IN NORTHEAST CHINA

This plant was photographed [redacted] with no apparent change in the level of operation. Note the three large rotary kilns of which two are vented by the smoking stack and one is vented by the stack which is not smoking.

25X1

significantly, however, 18 of these plants were covered in both 1962 and 1963, making it possible to compare the levels of operation of these plants over a 2-year period.

2. Estimated Production in 1963

a. Comparison of Photography in 1962 and 1963

Photography of the 18 cement plants covered in both 1962 and 1963 revealed no apparent change in the level of operation at 14 of the plants. The level of operation at three important plants, however -- at Shanghai, at Liu-li-ho near Peiping, and at Yung-teng near Lan-chou -- was clearly higher in 1963. The level of operation at one other large plant, the Yao-hsien plant above Sian, was difficult to determine, although it was clearly operating on at least as high a level as in 1962 and possibly higher.*

b. Analysis of Photography in 1963

Analysis of the 24 plants photographed in 1963 suggests a level of operation of between 55 and 60 percent of rated capacity** compared with 45 to 50 percent in 1962. Based on national rated capacity in the industry of between 11 million and 14 million tons, output in 1963 calculated on a 57-percent operating level would be 6.3 million to 8 million tons -- roughly 1 million tons more than in 1962.

The above estimate for production is bolstered by official Chinese Communist claims of increased production of cement in 1963. Such claims ranged from an increase of 25 percent for the first quarter 2/ and an increase of 39 percent for the first half 3/ to an increase of 24 percent for the first 10 months of the year. 4/ An estimate of production using the most recent claim of 24 percent and calculated on the 1962 base of 5 million to 7 million tons falls between 6.2 million and 8.7 million tons and is very close to the above independent range of 6.3 million to 8 million tons estimated from an analysis of aerial photography. The proximity of the lower limits of the two estimates suggests that the lower limit of the revised estimate for 1962 of 5 million to 7 million tons probably was closer to actual production than the upper limit. A final estimate for production in 1963, therefore, should favor the lower portion of the range.***

---

* For a discussion of the Yao-hsien plant, see Appendix A.

** For methodology, see Appendix B. The estimated rated capacity of the plants photographed in 1963 was between 7.3 million and 8.4 million tons, and they were operating at a level estimated to produce 4.1 million to 4.9 million tons.

*** For production of cement in Communist China and India since 1949, see the table, p. 6, below.

Production of Cement in Communist China and India
1949-63

Thousand Metric Tons

Year	Communist China a/	India b/
1949	660	2,136
1950	1,410	2,655
1951	2,490	3,247
1952	2,860	3,588
1953	3,880	3,841
1954	4,600	4,469
1955	4,500	4,559
1956	6,390	5,007
1957	6,860	5,691
1958	9,300 c/	6,166
1959	12,270 d/	6,936
1960	e/	7,844
1961	6,000 f/	8,245
1962	5,000 to 7,000 g/	8,587
1963	6,000 to 8,000 g/	9,236 h/

a. Source 5/ unless otherwise indicated.
b. 6/
c. Perhaps including 1.4 million tons from small backyard plants. 7/
d. Including 1.72 million tons from small shaft-kiln plants of a design alleged to be more advanced than the backyard plants used in 1958. 8/
e. The plan for 1960 was to produce 16 million tons, with one-third of the amount to come from small plants. 9/ It is virtually certain that this plan was not fulfilled, and that, at the maximum, production from major plants in 1960 did not exceed 11 million tons.
f. Based on a refugee report. 10/
g. Based on aerial photography. The estimate for 1962 is supported by source 11/.
h. For the fiscal year September 1962 through August 1963.

3. Significance of an Increase in Production of Cement

Although there is still idle capacity in the cement industry of Communist China, an increase in production by roughly 20 percent in 1963 suggests a more or less comparable increase in the volume of construction from the low point of 1961-62.* When the retrenchment was ordered by the regime in early 1961, construction activity throughout the country came

* For a discussion of the high positive correlation between apparent consumption of cement (production less net trade) and the volume of construction in the US and Communist China, see source 12/.

to a virtual standstill. Appropriated but unused funds for capital construction were frozen, construction budgets for 1961 were slashed, and rigid control over the use of construction materials was enforced.* Only projects nearing completion and projects of the highest priority were allowed to continue, and these were few in number when compared with the total volume of projects underway.

In 1963, however, the regime released a number of reports claiming increased construction activity in various sectors in the economy, and photography tends to support these claims. For example, photography shows construction activity at national defense facilities and in those sectors acknowledged by the Chinese Communists to be weak links: petroleum refining and extraction, the chemical industry, the extractive industries, forestry railroads, some harbor and dock facilities, roads in the border areas, and advanced weapons facilities. Photography also shows, however, a large number of other projects where little if any progress in construction has been apparent during the past few years. Moreover, unused capacity in the cement industry indicates that the total volume of construction in China in 1963 was still considerably below the more active years of 1958-60. The importance of the Chinese accomplishment in 1963, therefore, is that a further drop in the volume of construction did not occur and that a modest upturn from a very low base was probable.

4. Plants Producing for Export

All plants known to produce for export were operating at a high level when photographed in 1962 and 1963. The majority of these plants are located in Manchuria and in the coastal regions of Communist China and produce a high-quality product for export to the USSR and Southeast Asia. China's shortage of foreign exchange and the obligation to pay for past imports from the USSR adequately explain why these plants are in operation.

Although complete trade statistics are not available, preliminary information suggests that exports of cement to the USSR and to the Free World have gradually increased since the retrenchment in construction was announced in 1961. It is possible, therefore, that a small portion of the increase in production in 1963 could have been exported rather than consumed domestically.

* It is reported, for example, that with the announcement of retrenchment in 1961, construction activity in the electronics industry came to a standstill when work was halted on more than 50 projects then under construction. Later in the year, work was allowed to continue on a few priority projects nearing completion, although the majority of the funds appropriated for construction in 1961 were used to maintain unfinished projects from physical deterioration. 13/

5. Cement Plants Under Construction

Aerial photography in 1962 and 1963 indicates that construction of a number of large cement plants either has stopped or is progressing at a very slow pace. During the "leap forward" movement, when shortages of construction materials were so acute that the speed of construction was threatened, the Chinese Communists started building enough new cement plants to increase the rated capacity of the industry by as much as 25 percent. These plants are located at such places as Han-tan in Hopeh, Yung-an in Fukien, Ying-te in Kwangtung, Hsiang-hsiang in Hunan, Wu-han in Hopeh, and Liu-chou in Kwangsi. Approximately 5 years have passed since these plants were started, and they are still in various stages of construction. The decision to slow or halt this construction reflects the drop in demand following the collapse of the "leap forward" and strongly suggests that present installed capacity is adequate for some time to come.

IV. Further Information on Cement Plants in 1963

During the statistical blackout following the collapse of the "leap forward" in 1960 the Chinese Communists released few data on production and capacity of individual cement plants. Somewhat more information began to appear in 1963, consisting mainly of vague references, often less than candid, to "improved quality of production" and the "overfulfillment" of unspecified plans.

1. Canton Cement Plant

In 1963 the Chinese Communists announced that a large new cement kiln had been completed and placed in operation at the Canton cement plant. They claimed that construction of the kiln began in 1960 and that it started production in May 1963. This achievement was heralded as an example of China's ability to manufacture large and complicated pieces of machinery without outside help.

25X1

Aerial photography [redacted] clearly reveals a large new kiln in the final stages of construction, and photography [redacted] shows the same kiln in operation. Reliable reports indicate, however, that planning for construction of the kiln began in 1958 during the height of the "leap forward" movement, long before the present policy of self-sufficiency was announced. Moreover, its construction took almost 5 years from drawing board to trial production -- equal to the average time previously required to build an entire cement plant imported from the European Satellites. In addition, reports indicate that part of the machinery used in construction of the kiln originally came from Poland and was not produced in China as claimed.

25X1

2. Yung-teng Cement Plant

The memorandum on the cement industry in Communist China in 1962 14/ stated that the important Yung-teng cement plant near Lan-chou was not

25X1 in operation. This conclusion was based on an analysis of aerial photography [redacted] and on refugee and other reports. It appears now, however, that the plant started limited operation in late 1962 and continued operation in 1963.

During 1963 the Chinese Communists released a number of press reports extolling the production accomplishments of the Yung-teng plant. For example, one press release stated that "this year's production plan is 12 percent higher than actual output in 1962, and the 1964 production plan is expected to be 25 percent higher than this year's." 15/ Aerial photography confirms the Chinese claim that the plant was in operation in 1963 -- at about one-fourth of rated capacity. One of four kilns clearly was emitting dust in the September coverage. It should be no great task, therefore, to increase production in 1964 by "25 percent."

3. Pen-ch'i Cement Plant

In November 1963 the Chinese claimed that the Pen-ch'i cement plant in Liaoning Province had "fulfilled its 1963 production plan 2 months ahead of schedule." 16/ The Chinese failed to mention, however, that the Pen-ch'i cement plant actually consists of two separate plants and is considered to be the largest cement complex in China, with each facility able to produce about 400,000 tons annually. The 25X1 two Pen-ch'i plants were photographed [redacted] and in 25X1 [redacted] and on each occasion one plant was operating at a high level while the other plant showed no signs of activity. The implication of the Chinese statement, therefore, is that the production plan in 1963 for the Pen-ch'i complex as a unit was set at about 50 percent of capacity.

APPENDIX A

AERIAL PHOTOGRAPHY AS A SOURCE OF INFORMATION ON THE CEMENT INDUSTRY

Aerial photography is an excellent source of information in determining whether or not a cement plant is in operation. The very fine abrasive grinding of large quantities of raw materials and the use of coal to fire forced-draft kilns results in the emission from the stacks of large quantities of dust and smoke, which are clearly visible in aerial photographs. An accurate estimate of production from a given plant, however, varies directly with (1) the quality of the photography, (2) the number of times a plant is covered, (3) the reliability of nonphotographic information on plant capacities, and (4) the quality of cement being produced.

1. Quality of Photography

The quality of the photography is vitally important in estimating the operating level of a given cement plant. For example, the photograph [redacted] of the Yao-hsien plant above Sian was taken on a clear day and from a vertical angle. This excellent shot clearly revealed one of three kilns in operation at this large plant built by East Germany. 17/ On the other hand, in 1963 the quality of coverage of the Yao-hsien plant was not as good as in 1962, because it was photographed from an oblique angle through hazy cloud cover. Smoke was clearly visible, thus indicating that the plant was in operation, but it could not be determined if more than one kiln was operating. The best estimate of the level of operation at this plant, therefore, is that it was no lower than in the 1962 coverage and possibly could have been higher.

25X1

2. Repeated Coverage

The reliability of the method of estimating the operating level of a cement plant from aerial photography increases with the number of times a plant is photographed. During periods of high demand for cement the kilns at a plant are normally kept in operation 24 hours per day, 7 days per week. Kilns are rugged pieces of machinery that can operate continuously for months, but occasionally they are shut down for periodic maintenance such as relining. If a plant is photographed at such times, it may not appear to be in operation. If a plant is photographed two or three times over a period of 2 years, however, it is highly unlikely that the kilns will be shut down for maintenance on each occasion -- particularly if flights occur during different seasons of the year.

A number of cement plants in China have been photographed as many as three and four times with no visible change in the level of operation. For example, the K'un-ming plant was covered [redacted] 25X1 and on each occasion one of two kilns was in operation. It was always the same kiln; therefore, it can be estimated with confidence that the other kiln was shut down for reasons other than periodic maintenance. The plant obviously was operating at about 50 percent of rated capacity over an extended period of time.

3. Quality of Nonphotographic Information

The rated capacity of the cement industry is estimated by aggregating the rated capacities of all known individual cement plants in Communist China. Information on individual cement plants is obtained from nonphotographic reports, and the quality of these reports varies from plant to plant. Therefore, production estimates for individual facilities may be subject to a large margin of error, but, in the aggregate, reasonable accuracy is possible because of compensating errors.

4. Quality of Production

For a variety of technical reasons, the quantity of output of individual cement plants in Communist China varies inversely with the quality of output. In other words, if a plant operates at capacity producing grade 400 cement, it could produce considerably more than if it produced grade 500 cement. This fact partly explains how the Chinese were able greatly to increase production of cement during the "leap forward" period, when large quantities of low-grade cement were produced at the expense of smaller quantities of higher grade cement.* During the retrenchment in construction since 1961, however, the Chinese have placed great emphasis on improving the quality of cement, and they probably have succeeded to some degree. Therefore, because output varies with the quality produced, it is difficult to estimate precisely from aerial photography how much a given plant is actually producing.

* The large increase in production during the "leap forward" was not as impressive as it appeared, because the quantity of cement required to make concrete of a given strength varies with the quality; thus, in constructing a project requiring concrete, considerably more grade 400 cement would be needed than grade 500 cement.

APPENDIX B

METHODOLOGY

The operating level of 55 to 60 percent used to estimate production of cement in Communist China in 1963 is a weighted average of the 24 plants at time of coverage. The combined rated capacity of these plants was estimated from collateral information to fall between 7.3 million and 8.4 million tons, and the plants were operating at a level estimated to produce 4.1 million to 4.9 million tons. The Chinese were given the benefit of the doubt because (1) when a plant was obscured by smoke or dust, it was assumed to be operating at rated capacity, and (2) when two kilns at a given plant were vented by a single stack that was smoking, it was assumed that both kilns were in operation.

Theoretically a further refinement could be made in the methodology by deducting 10 to 20 percent from the total rated capacity for downtime for maintenance. This adjustment was not considered, because the industry as a whole was operating considerably below capacity. If the cement industry continues to increase output from existing facilities, however, an adjustment for downtime must be considered in future estimates.

APPENDIX C

COMMUNIST CHINA: CEMENT PLANTS COVERED BY AERIAL PHOTOGRAPHY

1963

25X1

Location	Name	Started Construction	Metric Tons: Estimated Rated Capacity	Metric Tons: Estimated Level of Operation in 1963	Other Data
Canton, Kwangtung Province 23°09'N - 113°14'E	Canton or Hsi-ts'un	Pre-1949	500,000	400,000	The level of operation appears to have been the same in 1962 and 1963. The Chinese claim that a new kiln was placed in operation in [redacted] Photography in [redacted] shows this kiln in operation. 25X1 25X1
Chiang-shan, Chekiang Province 28°42'N - 118°34'E	Chiang-shan	1958	300,000	300,000	At least two kilns. The plant was in operation at the time of coverage. This plant was built with Rumanian machinery.
Chiang-yu, Szechwan Province 31°59'N - 105°04'E	Chiang-yu	1957 or 1958	700,000	0	The quality of the photography is poor, but the plant does not appear to be in operation.
Chin-hsi, Liaoning Province 40°46'N - 120°51'E	Chin-hsi	Pre-1949	350,000	230,000	The level of operation appears to be the same in Aug 62 and May 63. Two of three kilns appear to be in operation.
Chiu-chiang, Kiangsi Province 29°37'N - 116°07'E	Lushan	1959 or 1960	60,000	60,000	Excellent photography shows the plant in operation. It has one rotary kiln and was built with Czechoslovak machinery.
Chungking, Szechwan Province 29°32'N - 106°34'E	Chungking or Szechwan	Pre-1949	200,000 to 300,000	100,000 to 150,000	This plant has three or four rotary kilns. It appears to be operating at about 50 percent of capacity.
Dairen, Liaoning Province 38°56'N - 121°14'E	Dairen	Pre-1949	350,000 to 400,000	350,000 to 400,000	There was no apparent change in the level of operation during 1962-63. Two to four rotary kilns are in operation. This plant produces for export to the USSR.
Fu-shun, Liaoning Province 41°51'N - 123°49'E	Fu-shun	Pre-1949	300,000 to 500,000	0	This plant does not appear to have been in operation in 1962 or 1963. It is believed to have two rotary kilns.
Harbin, Heilungkiang Province 45°50'N - 126°43'E	Harbin	Pre-1949	200,000 to 300,000	200,000 to 300,000	This plant had the same high level of operation in 1962 and 1963. It probably has two rotary kilns.

Location	Name	Started Construction	Metric Tons: Estimated Rated Capacity	Metric Tons: Estimated Level of Operation in 1963	Other Data
Hsiang-hsiang, Hunan Province 27°44'N - 112°12'E	Hsiang-hsiang	1958	N.A.		This plant does not appear to have been in operation, but the poor quality of the photography precludes a definitive statement. The plant may be in the final stages of construction.
Huang-shih, Hupeh Province 30°14'N - 115°04'E	Hua-hsin	In 1947 with US aid	400,000 to 500,000	400,000 to 500,000	There was no apparent change in the level of operation in 1962 and 1963. There are two large rotary kilns.
K'un-ming, Yunnan Province 25°01'N - 102°37'E	K'un-ming	1955 or 1956	300,000	150,000	There was excellent coverage in 1962 and 1963, showing one of two kilns in operation. This plant was built with East German machinery. 25X1
Liu-chou, Kwangsi Province 24°22'N - 109°15'E	Liu-chou	1958 or 1959	N.A.		Excellent coverage shows two rotary kilns not in operation. The plant appears never to have been in operation, and the [redacted] shows the plant rather overgrown, possibly from disuse. This plant was built with Czechoslovak machinery. 25X1
Liu-li-ho, Hopeh Province 39°35'N - 116°02'E	Liu-li-ho	Pre-1949	500,000 to 600,000	500,000 to 600,000	This plant was not in operation in 1962 but was operating in 1963.
Pen-ch'i, Liaoning Province 41°16'N - 123°43'E	Kung-yuan	Pre-1949	400,000	0	There was no apparent change in the level of operation in 1962 and in 1963. At least two rotary kilns were not in operation.
Pen-ch'i, Liaoning Province 41°18'N - 123°44'E	Pen-ch'i	Pre-1949	400,000	400,000	This plant was in operation in both 1962 and 1963. There are at least two rotary kilns.
Shanghai, Shanghai Shih 31°09'N - 121°27'E	Shanghai	Pre-1949	300,000 to 400,000	300,000 to 400,000	This plant is believed to have five rotary kilns. One appeared to be in operation in 1962 and all five in 1963.
T'ai-yuan, Shansi Province 37°52'N - 112°25'E	T'ai-yuan	Pre-1949	150,000 to 300,000	150,000 to 300,000	This plant is believed to have two rotary kilns. Both were in operation in 1962 and 1963.
Ta-t'ung, Shansi Province 39°59'N - 113°07'E	Ta-t'ung	1955	500,000 to 600,000	250,000 to 300,000	This plant appears to be operating at about 50 percent of capacity. Two of four kilns are in operation. It was built with East German machinery.

Location	Name	Started Construction	Estimated Rated Capacity (Metric Tons)	Estimated Level of Operation in 1963 (Metric Tons)	Other Data
Wu-ch'ang, Hupeh Province 30°38'N - 114°26'E	Wu-han	1958	200,000	0	This plant does not appear to have been in operation in 1962 or 1963. It has one rotary kiln; a second kiln was under construction, but no progress was discernible between 1962 and 1963. There is another cement plant under construction at Wu-han, but work on it seems to have stopped.
Yao-hsien, Shensi Province 34°56'N - 108°59'E	Yao-hsien	1957 or 1958	700,000	230,000	The quality of the photography is poor, but it is certain that the plant was in at least partial operation. In 1962, one of three rotary kilns was operating. The plant was built with East German machinery.
Ying-te, Kwangtung Province 24°19'N - 113°27'E	Ying-te	1958	N.A.		This plant is still under construction; it appears to be progressing very slowly, if at all.
Yung-an, Fukien Province 26°02'N - 117°19'E	Yung-an	1958	N.A.		This plant is under construction, although very little progress was noted between 1962 and 1963.
Yung-teng, Kansu Province 36°46'N - 103°18'E	Yung-teng	1954	500,000 to 600,000	125,000 to 150,000	This plant was not in operation in the [redacted] although other evidence indicates that it may have started limited operation late in 1962. The plant appears to have been in partial operation in the 1963 coverage, with one of four kilns emitting dust. It was built with East German machinery.
Total			Million Metric Tons: 7.3 to 8.4	4.1 to 4.9	

25X1

APPENDIX D

SOURCE REFERENCES

1. CIA. CIA/RR EM 62-20, Level of Operation of the Cement Industry in Communist China in 1962: A Study Based on Aerial Photography, [redacted] S/NO FOREIGN DISSEM.
2. FBIS. 63 W387, Peiping, 14 May 63. OFF USE.
3. State, Hong Kong. Weekly Economic Report, no 34, 23 Aug 63. C.
4. FBIS. 63 W1223, Peiping, 28 Nov 63. OFF USE.
5. Communist China, State Statistical Bureau. The Great 10 Years, Statistics on Economic and Cultural Construction Achievements of the People's Republic of China, Peiping, 1959. U.
6. India, Central Statistical Organization. Monthly Statistics of the Production of Selected Industries of India, Calcutta, 1961-63. U.
7. CIA. CIA/RR ER 61-19, The Construction Materials Industry in the Communist Far East: Status and Prospects, Apr 61, p. 8. S.
8. Ibid.
9. Ibid.
10. [redacted]
11. Ibid., no 5251/62, 28 Sep 62. S.
12. Commerce. Construction Review, vol 7, no 3, Mar 61, p. 5. U.
    CIA. CIA/RR CB 63-36, Investment in Communist China Cut Back Drastically During 1961-62, 12 Apr 63. S.
13. [redacted]
14. CIA. CIA/RR EM 62-20 (1, above).
15. FBIS. 63 B2803, Peiping, 21 Nov 63. OFF USE.
16. FBIS. 63 B2934, Mukden, 29 Nov 63. OFF USE.
17. CIA. CIA/RR EM 62-20 (1, above), Figure 7. S/NO FOREIGN DISSEM.